Early city of Portland.

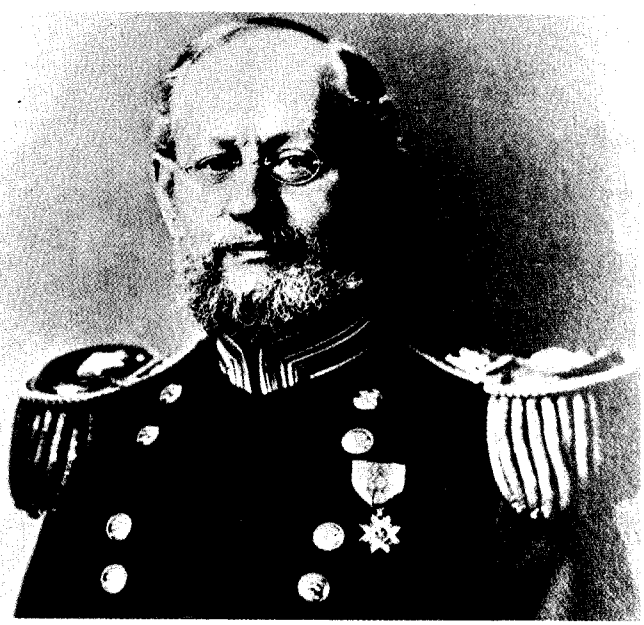
Chapter 2 Early Navigation Work of the Portland Office, 1871 to 1877

Major Robert

The growing importance of the Columbia and Willamette Rivers as navigational waterways led to the establishment of the Portland Engineer Office in 1871. The region's commercial development depended upon the improvement of these rivers. In their nearly natural condition, the Willamette and Columbia could not efficiently meet foreseeable demand for safe, extensive movement of goods and people. Orders from the War Department on 28 March 1871 divided Corps of Engineers responsibilities for the West Coast at roughly the Oregon-California border. Prior to that time, the San Francisco Engineer Office had charge of the Corps work in Oregon. The Chief of Engineers directed Major Henry M. Robert to establish an engineer office in Portland and continue work under the authorization, "Improvement of Rivers in Oregon."[1]

Major Robert, later famous for his *Rules of Order,* arrived in Portland on 17 April 1871. He rented office space, bought office furniture, hired a clerk, and employed one assistant engineer. The salary of Robert's assistant was limited to $150 per month; and his spartan office quarters consisted of one desk, one paper case, one map case, and four office chairs. Robert's initial orders required him to submit projects based on money appropriated for improving the Umpqua River in southwestern Oregon and the Willamette River above Oregon City "with regard being had to the present demands of commerce, the permanent completion of the improvement, and the strictest economy in the disbursement of the moneys appropriated."[2]

When Major Robert stepped off the steamer *Oriflamme* along Portland's bustling waterfront, he discovered, in the words of a contemporary newspaperman a "thriving



Major Henry M. Robert, first Portland Engineer Officer in Charge, 1871.

cosmopolitan little city, with business much diversified and doing a heavy business." In the early 1870s, Portland was reputed to be one of the richest towns of its size in the United States. Its population of about 10,000 had grown 188 percent in just ten years. Brick buildings and large cast-iron fronted commercial palaces were rising along Front and First streets next to the Willamette River. The railroad pushing up the Willamette Valley towards California promised more growth for the future, augmenting the wealth from the city's waterborne commerce.[3]

The establishment of an engineer office reflected the rapid growth and evident potential of Columbia and Willamette river shipping. The flow of waterborne commerce on the Columbia had received its first strong impetus from the gold rush to California in 1848.

Great quantities of wheat and finished lumber were shipped to San Francisco. In 1853 the first cargo of foreign export lumber from the Pacific Northwest left Portland for Australia. John C. Ainsworth informed Major Williamson in 1867 that Oregon Steam Navigation freight and passenger activity in the first half of the 1860s had more than quadrupled. The year 1868 marked the beginning of wheat exports from Portland. The first shipment went to Liverpool, England, and Portland soon became the West's chief wheat export city.

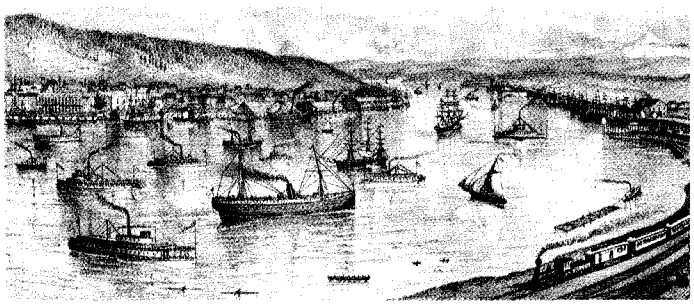
After arriving in Portland in the Spring of 1871, Major Robert immediately conducted a reconnaissance of the area under his responsibility. By September, he reported on the growing river traffic in Portland:

> *During the past nine months 106 vessels, of an aggregate tonnage of 73,714 tons, have arrived at this port. Of these 70 were steamers, 5 ships, 23 barks, 8 brigs and schooners, and many were heavily laden with railroad iron, and took out, on their departure, full cargoes of wheat to Liverpool and China . . . . Since October last, the coin collections at this port alone amounted to more than $210,000, and more than twenty vessels with full cargoes have arrived in this river from distant foreign ports, taking out from hence full cargoes of domestic produce.*[4]

Within three years, 85 ships were operating in the wheat business alone.

A cycle had begun which reinforced and strengthened river activity and, indeed, the commerce of the entire region. The increasing profitability of commerce attracted more people to the area. They, in turn, demanded more goods and services. Filling their needs led to improvements in transportation and enhanced productivity. Yet, while wheat and lumber made this growing commerce valuable, the river made it possible. Without cheap transportation, profitable development of the resources of the region would have been much delayed: to early Oregonians river transportation was a vital necessity. Thus, elimination of the immediate impediments to navigation and obtaining precise knowledge of the territory embraced by the Portland office constituted the chief goals of the early Corps engineers.

Major Robert's first recommendation as the engineer in charge of the Portland office called for the removal of a bar at St. Helens, located 20 miles down river from the mouth of the Willamette. In 1871, he cited the St. Helens Bar and others in the channel of the Columbia River as "serious obstacles to the development of the foreign trade of this port." These obstructions frequently delayed vessels of 17 and 18-foot drafts for considerable



The harbor of Portland, circa 1881.

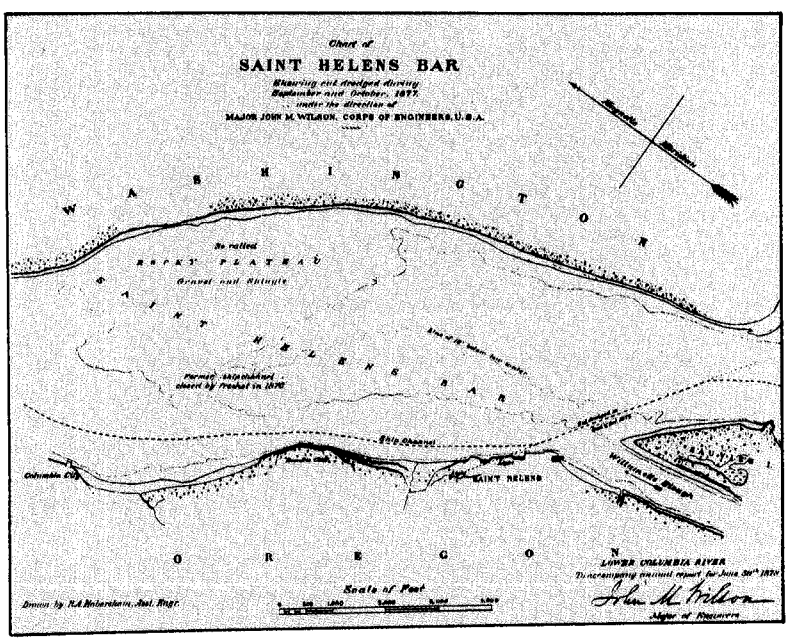


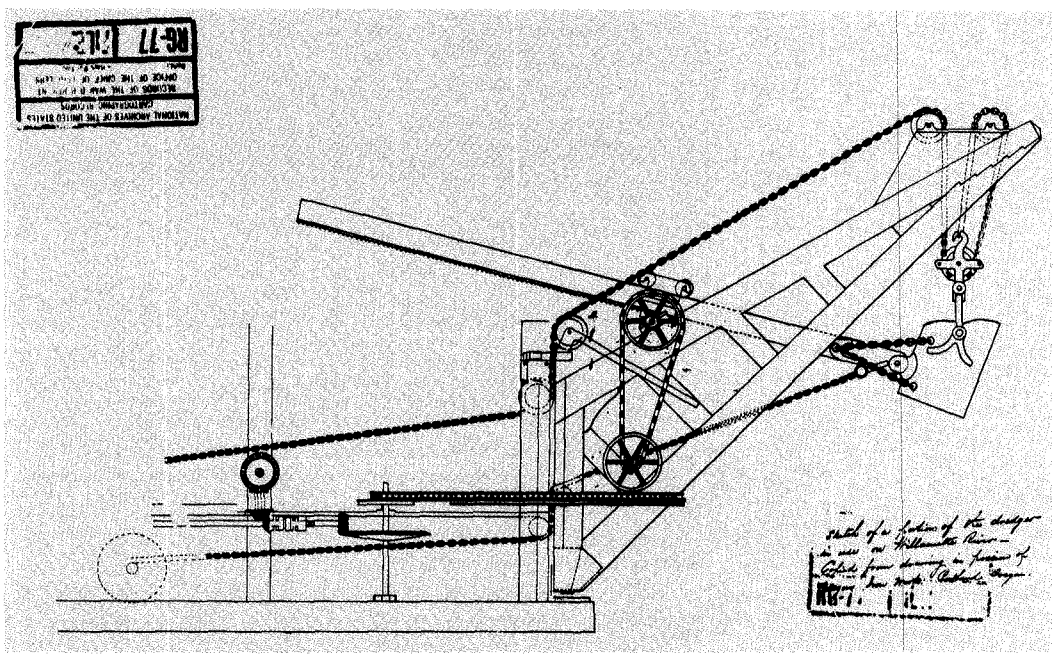
Chart of Saint Helens Bar in 1877.

periods of time. In most of these cases it became necessary to transfer cargo from the stranded vessels to smaller ships, thereby adding a significant expense.[5]

Before Robert arrived, no work had been done on the Columbia below Portland. Authorized work had been confined to the Willamette River from Portland to its mouth. Major Robert wanted to change that. In 1872, he wrote that the object of appropriations, the improvement of sea-going commerce to Portland, would be served by expansion of the scope. "One bar in the Columbia last year," he wrote, "was a more serious hinderance than anything in the Willamette." He wanted the appropriation to cover work on both rivers, from Portland to the sea.[6]

After another survey in 1872, Congress made the change requested by Robert. The new appropriation recognized that, for navigational purposes, the lower Willamette and the lower Columbia comprised a single unit. Improvements on the one without alterations on the other produced no real benefits to either. Initial work on the St. Helens Bar began in 1873, but was not completed until the following year because of unusually high water. The first improvements there and at Swan Island on the Willamette marked the first work on the Portland-to-the-sea waterway. The 17-foot deep safe water provided by these two projects supported almost 185,000 tons of freight traffic in 1875. To Portlanders, who had watched traffic on the river rise year after year, this represented a great deal of commercial activity.[7]

Major Robert also succeeded in securing the Portland District's first dredge. When he arrived in Portland, the Corps was still using the dredge owned by the city. This craft was in such a deteriorating condition that Robert decided the money would be put to better use

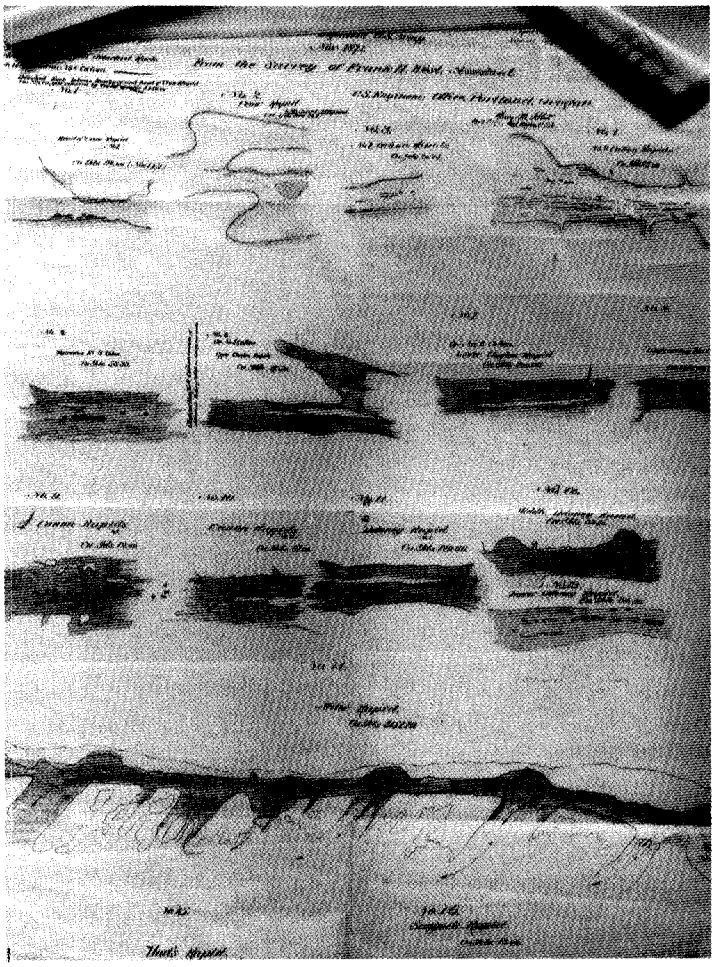


Plan drawing for early dredge used on Willamette River.

constructing a new vessel. In 1872, Major Robert secured an appropriation of $35,000 for this purpose, had the dredge built, and continued dredging operations already begun. Though a depth of 17 feet had been obtained at both the mouth of the Willamette and at Swan Island, the two feet of sand and silt deposited by the annual freshet had to be removed to maintain that depth.[8]

Major Robert brought a candid, no-nonsense attitude to his work. His evaluation of the attempt to render the Umpqua River navigable for 120 miles from Scottsburg to Roseburg revealed his approach. After spending almost $18,000 removing 1,918 cubic yards of rock at 15 different points on the river, Robert personally descended the Umpqua in a skiff to assess the results. He found the work satisfactory and a clear channel established but concluded that "the current of the river is so rapid that, with all this improvement to the channel, it cannot be navigated profitably." The refusal of the steamboat company requesting the improvements to make use of them and a careful study of competing means of transportation in the region convinced him that the project should never have been undertaken. In a special report to the Chief of Engineers, he stated that

> *as the reconnaissance and appropriation had been made before the work was transferred to me, and I was merely required to submit a project for its expenditure, I did not think I had anything to do then with the investigation of the question of the advisability of the improvement, especially as to have done so at that time would have postponed the work . . . for a period of one year. In reviewing the work, however, and making a report thereon, its success or non-success must be considered, and a careful investigation of the subject satisfies me*



Umpqua River chart done by Major Robert

> *that the appropriation should never have been made. The channel is made, but it will not pay anyone to navigate the river.*[9]

Other work under Major Robert's leadership involved surveys and improvements on the upper Columbia, the Yamhill River, an examination of Port Orford in southern Oregon, and improvements on the upper Willamette River. The work on the Columbia furthered the earlier efforts of Major Williamson and Lieutenant Heuer at Umatilla and Homly Rapids, and included the actual removal of John Day Rock. The study at Port Orford arose from Robert's belief that it would make a suitable location for a harbor of refuge.[10]

The renewed work on the upper Columbia once again resulted from the insistent lobbying of John Ainsworth, president of the Oregon Steam Navigation Company. Writing to remind Major Robert that work begun under Major Williamson remained uncompleted, Ainsworth stressed the great public benefit to stem from the proposed improvement to navigation on the upper Columbia River. But he also played down the difficulties involved:

> *Walla Walla Valley alone, with boundaries and resources sufficient for a State, to say nothing of Eastern Oregon, Northern Idaho, and Western Montana, is wholly dependent on the Columbia River for the transportation of the large surplus of grain . . . . If one rock in 'John Day's Rapids' were removed, a few loose boulders in 'Devil's Bend,' we could then run our large-sized steamers, and, by the assurance of transportation, and consequently good markets, this large, important, and rapidly improving country would have free communication with, and access to, the commerce of the world. Every available house in Wallula is now filled with wheat that will have to remain there till next May.*[11]

Of course, the OSNC monopoly of river traffic meant that it would profit handsomely from the Corps' improvements on the Columbia.

Major Michler

From 1873 to 1876, Major Nathaniel Michler took charge of the Portland Engineer Office. Accomplishments of the Corps during his tenure included continuance of projects already underway or authorized and the initiation of projects of the same type in new areas. Major Michler carried on with the dredging of the lower Willamette and continued the work begun at St. Helens. Snagging, rock removal and bank protection continued on the Willamette, above and below the falls at Oregon City, and a thorough reconnaissance of the river between Portland and Eugene was completed. Michler ordered wing dams built on the Willamette River between Oregon City and Salem at Lone Tree Rapid and Union Bar

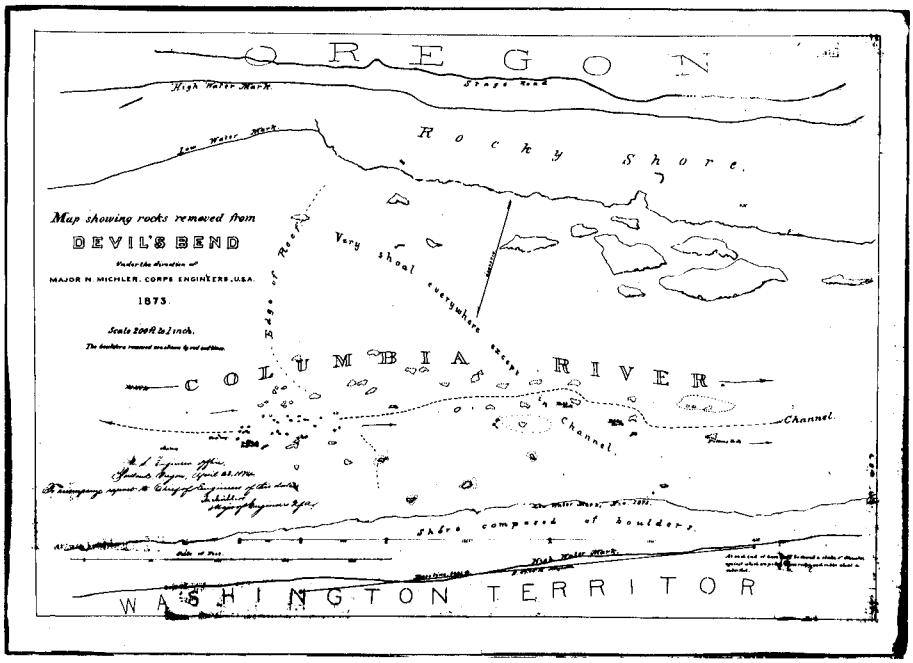


Chart of Devil's Bend rapid in Upper Columbia River.

Rapids. Oregon politicians pressured the Chief of Engineers to approve Michler's projects on a priority basis. Rocks on the Columbia at Umatilla Rapids, Devil's Bend and Squally Hook Rapids, previously surveyed by Major Robert, were blasted and removed. Michler also surveyed and eliminated the obstructions at Post Office Bar on the Willamette River two miles from its mouth. He started the removal of rapids as far as the mouth of the Snake River, and surveyed obstructions beyond that point—both up the Columbia and into the Snake.[12]

This latter work sought to connect navigable waters with the railheads of the Northern Pacific and Union Pacific near Wallula and the Snake River. Large agricultural and mining areas deep in the interior were joined to Portland almost overnight. Although requested to reconnoiter the Snake River between Lewiston and Shoshone Falls, Michler questioned the value of such an undertaking: "The object to be attained is not very apparent, as the difficulties and almost the impossibilities of rendering this section of the river navigable are already too well authenticated."[13]

Michler's assistants performed numerous surveys. These included areas near the mouth of the Columbia—Point Adams, Cape Disappointment, Astoria Sand Flats, Sand Island, and the bar itself. The engineers also examined rivers in Washington Territory—the Puyallup, Skagit, Snohomish, and Chehalis—and the Yamhill River southwest of Portland. Initial surveys of the mouths of the Alsea, Coquille, and Nehalem rivers were the first steps towards many improvements at these locations on the Oregon coast. Michler had a map made of the Puyallup River as far upstream as its fork (21 miles). Beyond that he ordered no further work because "none but flat-boats and canoes can make an ascent above that point." At that time only 400 persons inhabited the entire valley. The main settlement was Tacoma.[14]

Major Michler's most important survey during his busy tour of duty at Portland was the first thorough examination of the Columbia River for the Cascades and The Dalles-Celilo canals. At these places the Columbia presented grave dangers to navigation, its whole force confined between towering walls as little as 125 feet apart. Explorers and settlers had feared these rapids since the time of Lewis and Clark. In his journal, Clark gave the Cascades of the Columbia its classic description: "This great Shute or falls is about ½ a mile, with the water of this great river compressed within the space of 150 paces in which there is great numbers of both large and small rocks, water passing with great velocity forming [foaming] and boiling in a most horriable manner."[15] Major Michler, clearly impressed by these locales, could not improve on Clark's narrative:

> *the magnificant, bold, and peculiar scenery at the two places can only be appreciated after a personal inspection. An attempt . . . to describe the passage of the Columbia, the great river of the north western section of the United States, through a channel confined between perpendicular basaltic rock walls and reduced in width at certain localities to only one hundred and twenty-five feet, as at The Dalles, would prove inadequate.*

Based on the findings of his assistant engineer, Major Michler stated that

> *the difficult problems of engineering which must be solved will, at least at one of the localities, The Dalles, at first study appear almost insurmountable; but at the*

other, the Cascades, no more difficulty will be encountered than upon works of a similar nature constructed through rocks.[16]

Begun three years after Major Michler's survey, work on the Cascades Canal relied on his preliminary findings but soon proved he had vastly underestimated the engineering problems involved.

Another of Michler's projects did not enjoy such good fortune. Water from Percy's Slough entered the Willamette River two miles above its mouth. The force of the current coming from the Columbia into the slough tended to back up or slow down the current in the Willamette. Consequently, sand and silt accumulated and formed an obstruction. To prevent slough water from silting the river, Major Michler attempted to construct a small dam at the narrowest portion of the slough. A few months after the dam's completion, high water flow washed it out. Michler blamed the contractor, who, he said "had sadly abused the confidence of this office." Apparently, while Michler was out of town on business and unable to supervise the progress of the work, the contractor had built the foundation with inferior materials. When the force of high water hit the dam, its bulk washed into the Willamette and formed a bar. Thus, Michler's dam became the very thing which it had originally been designed to remove.[17]

Major Michler encountered formidable engineering challenges in his effort to continue navigation improvements on the Columbia River. While his predecessors had accomplished much, there still remained many rocky obstructions in the upper reaches of the river. The intrepid Michler and his assistants devised ingenious methods to carry out the surveys and soundings in the swift currents over the dangerous rapids of the Columbia. For instance, at the Umatilla Upper Rapid the method devised for sounding the current required fastening, end-to-end, four scows measuring a total of 185 feet and anchoring them above the rapids. From the scows, the engineers took a series of soundings, beginning at the head of the channel. Along the entire length of the united scows, they carefully measured the river depth with a graduated iron rod. The scows were then hauled a distance of 18 feet and a new set of soundings taken across the width of the channel. The crew next allowed the scows to drop down their own length and repeated the entire measuring process until an area 900 feet by 75 feet was examined. At each shift of the boats, the surveyors established angles by triangulation and marked them with iron rods set in holes drilled into the rocks.

After blasting the rocks, the crew made a second examination of the channel. This time they started at its foot. The men first placed planking across the bow of the scows and then took soundings as before at five-foot intervals. They heaved the boats forward five feet by the hawser and continued their soundings until reaching the head of the channel. Once again the surveyors located each successive position of the scows by triangulation.[18]

Working in sub-zero temperatures amid drifting ice flows during the low-water period of winter, the men constantly risked their lives to accomplish their mission. In his final report, Major Michler sadly recorded that R. B. Randall, the assistant engineer in charge of the improvements upon the Upper Columbia, drowned when his boat capsized on the Umatilla Upper Rapids within hours of the completion of the project.[19]

The end of Major Michler's service in Portland on 28 December 1875 marked the completion of the first decade of Corps of Engineers work in the Northwest under the authority primarily for civilian projects. On the Columbia and Willamette Rivers, the Corps surveyed and eliminated several bars and rapids and removed great numbers of dangerous snags and rocks. Banks had been improved, and fast current provided by wing-dam construction reduced shoaling. Many important surveys had been made which would serve as guides for future projects as well as information for current use. Even at low water, navigation was reasonably safe and dependable for ocean-going vessels sailing from Portland to the sea, and for riverboats going from Portland to the mouth of the Snake and from Oregon City to Corvallis.

There were still numerous delays, and even a few disasters. The refilling of a bar before a United States dredge could get to it would sometimes strand a ship for a day or two, or require the use of small vessels to unload it. Occasionally, one of the remaining snags or rocks on the upper Willamette would fatally pierce a steamer. This was the fate of the Oregon Steam Navigation Company's *Shoshone.* After making an unprecedented run from the hitherto unpassed rapids of the upper Snake downstream to Lewiston, she sank after hitting a rock in the Willamette River near Salem in 1874.[20]

The improvements made by the Corps under its early engineers in Portland yielded great commercial benefits. The nearly ten-fold growth of river traffic from 1866 to 1876 would not have been possible without this work. Nonetheless, the efforts of the period—however effective and beneficial they may have been—were provisional and designed to meet the immediate needs of the area. Large, permanent projects which did not yield quick results were yet to come.

Major Wilson

When Major John M. Wilson, a recipient of the Congressional Medal of Honor for gallantry in action during the Civil War, arrived in Portland in January 1876, he

inaugurated a new period of Corps activities. For the next 50 years the Corps concentrated on construction of several large projects, which permanently improved coastal and river waterways for navigation. Until the late 1920s, the Portland District's principal works included jetties, canals and locks, and deep-water channels. These improvements to navigation focused chiefly on the Columbia and its major tributaries, as well as Oregon coastal harbors. Work progressed slowly. The vagaries of annual congressional appropriations and frequently revised project plans often extended the time required for their completion.

Major Wilson recommended permanent projects for the lower Willamette and Columbia. He wanted to prevent the annual refilling of bar areas on both streams and to maintain navigable depths of 20 feet from Portland to the sea. These improvements would reduce the costly dredging which each year consumed over half the budget appropriation and better serve the increasing trade and larger ships on the river. Portland's vigorous economy impressed Wilson. In 1877, imports valued at $388,476 and exports valued at $2,509,159 went through the harbor. Nearly all the export goods were grain products from the upper Columbia area. Since 1868, such exports had increased six-fold. Major Wilson clearly understood the importance of the river to this commerce:

> *The more I see of this section of the country and its growing foreign commerce, the more satisfied I am of the absolute necessity of keeping open a channel with a depth of 20 feet at low-water from Portland to the sea.*[21]

The first of these projects proposed by Major Wilson involved improvement of the bar at Swan Island, two miles below Portland. Major Wilson stated the problem quite well in his annual report to the Chief of Engineers in 1876. At this location, Major Wilson found two channels. Ships used the deep but narrow north channel in preference to the wide but shallow south one. The Corps cut and maintained a channel 100 feet wide and 18 feet deep through the bar which began three quarters of a mile above the island. Seasonal freshets partially filled the cut, forcing annual dredging. Wilson succinctly stated the problem: "As long as the water continues to run through both channels, just so long annual dredging will be required; confine it to one, and let the entire volume pass through it, and the natural result will be a deep and commodious river." But which channel should the engineers close? Wilson believed "that it should be the narrower of the two, and that if a dike should be built from the upper end of Swan Island to the north shore, closing the north channel, . . . a new channel should be opened south of the island, when it was once dredged it would give but little trouble thereafter."[22]

The next three projects called for permanent improvements at Post Office Bar, Coon Island Slough, and Nigger Tom Slough, all at the mouth of the Willamette nine and one-half miles from Portland. By constructing dams at the heads of these sloughs, and revetting the banks, Wilson intended to increase the velocity of the current in the Willamette and thereby eliminate the bars permanently.[23]

Another project was at St. Helens Bar on the Columbia 18 miles below the mouth of the Willamette at the foot of Sauvie Island. This bar extended over two miles in length. The width of the river plus the conflicting currents pouring into the river from the Willamette Slough (now Multnomah channel) and Vancouver Slough (now Lake River) on the south

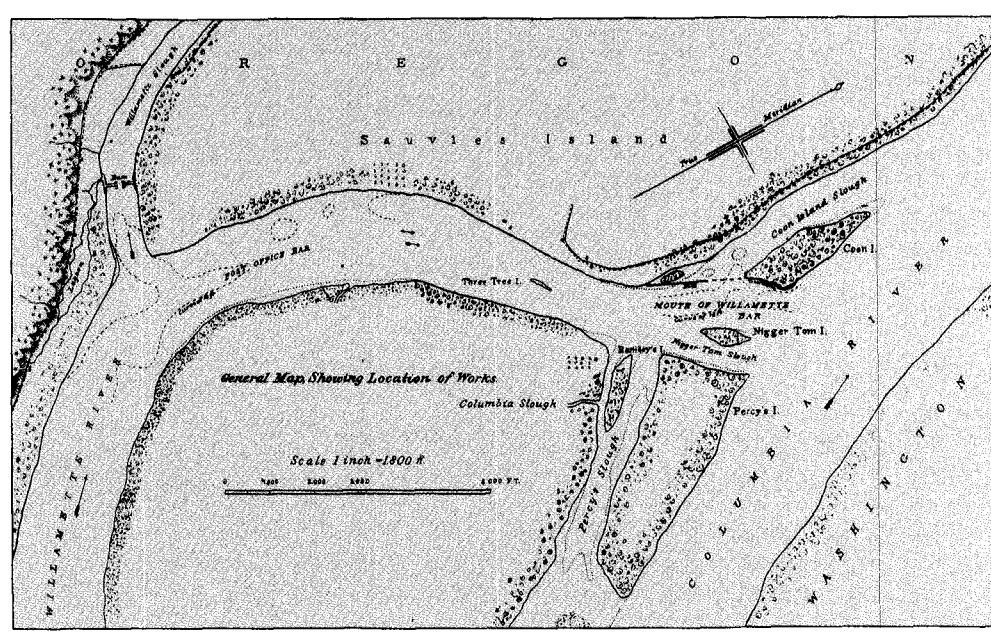


Chart showing Willamette River mouth improvements, 1879-1880.

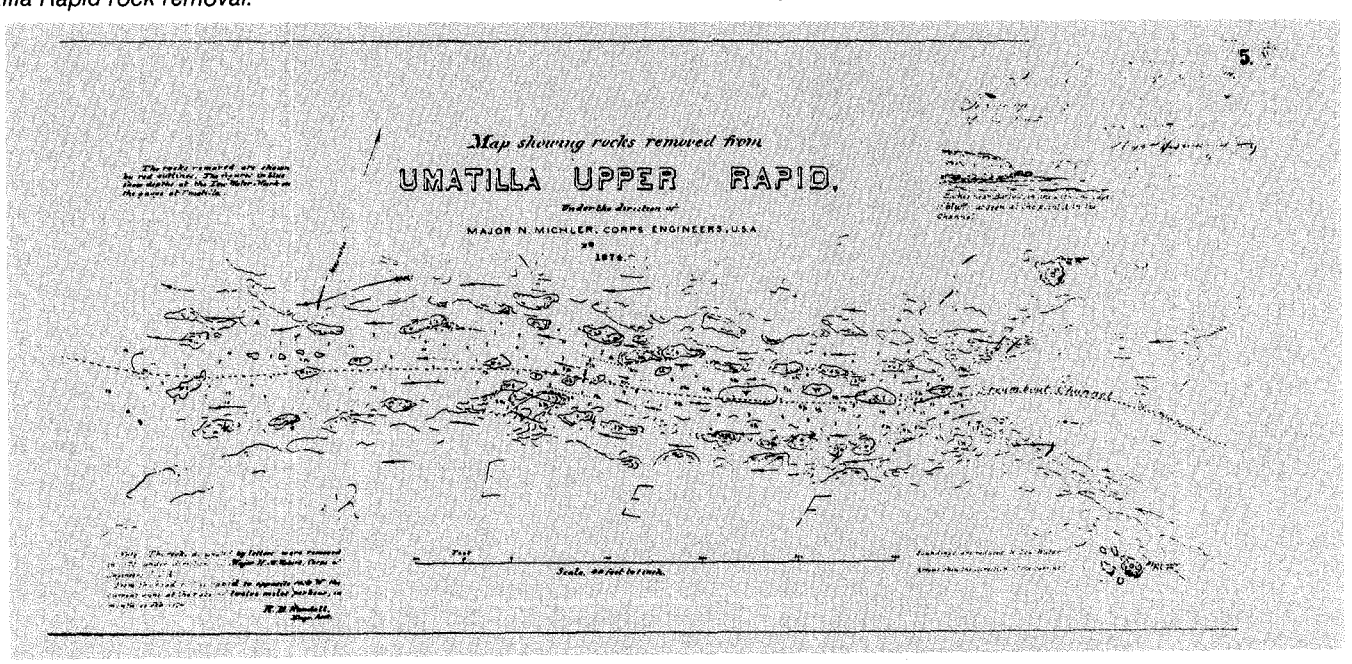
side and the Lewis River on the north side served to decrease the velocity of the river at this point, forming the bar. Warrior Rock, jutting boldly from the Oregon shore, complicated the situation because it acted as a wing dam and deflected the current to the far shore. The resulting bank erosion on the Washington Territory side caused the bar to shift and expand. The old navigation channel on the Washington side of the Columbia constantly required dredging and was undependable. To remedy this, Major Wilson proposed removal of roughly 100 feet of Warrior Rock, and "a dike from the shore below to receive the water, and gently lead it through the new channel." This new channel, which ran close to the Oregon shore along Basalt Cliff, St. Helens, and across the bar, opened in the fall of 1876.[24]

The procedure for authorizing Corps projects on the West Coast underwent reorganization just as Major Wilson submitted his proposals. In 1876, the Chief of Engineers, General Andrew Humphreys, established the Board of Engineers for the Pacific Coast. For the next ten years, it reviewed major projects in the Far West. Review boards such as this one also existed for other areas in the nation. They relieved the Office of the Chief of Engineers of the necessity of knowing everything about all major projects throughout the country. The Chief of Engineers and Congress usually accepted the conclusions of these boards. Composed of senior Corps of Engineers officers, the Board of Engineers for the Pacific Coast was headed by Lieutenant Colonel Barton S. Alexander. Lieutenant Colonel Robert S. Williamson, Major George H. Mendell, and Lieutenant Colonel C. Seaforth Stewart also served with Alexander. Major Wilson submitted his proposals concerning channel improvements to the Board for approval, and it delivered its decisions in April 1877.

The Board did not accept Major Wilson's view that the north channel at Swan Island should be closed. They cited the disruptive effect on commerce of shifting the channels and excessive cost as their reasons. Fifty-one thousand dollars, half the amount required to close the north channel, was allowed for closing the south channel. Major Wilson reported to the Chief of Engineers that he would resurvey the Willamette at Swan Island; and, if he reached the same conclusions he would resubmit his original report for appeal. The Chief told Wilson to submit his dissent through the Board, instead of sending it directly to his office.[25] At this point plans for any improvement at all were simply dropped. For ten years there was no mention of Swan Island in the *Annual Reports* of the Chief of Engineers, except for continued dredging. Not until 1927 did the Corp undertake the work at Swan Island, using Major Wilson's original plan.[26]

The Board approved the work on the Willamette at Post Office Bar and at the river's mouth as submitted. The Corps completed the dam at Willamette Slough in 1879, that at Coon Island in 1881, and the one at Nigger Tom Slough in 1883. The engineers filled the two sloughs at the mouth of the Willamette gradually.[27] For work at St. Helens, the Board recommended two 950-foot dikes "across the bar on each side of the present ship-channel, about a half mile below the lower end of Sauvie's Island"[28] Major Wilson concurred with the report, but work was not completed at St. Helens until 1889. The Corps of Engineers recommended to Congress an appropriation of $298,974 for these projects. Funds for Swan Island were applied to dredging operations. Together with this dredging, the four permanent projects provided an all-year, 20-foot navigable channel from Portland to the sea.[29]

below: Chart of Upper Umatilla Rapid rock removal.

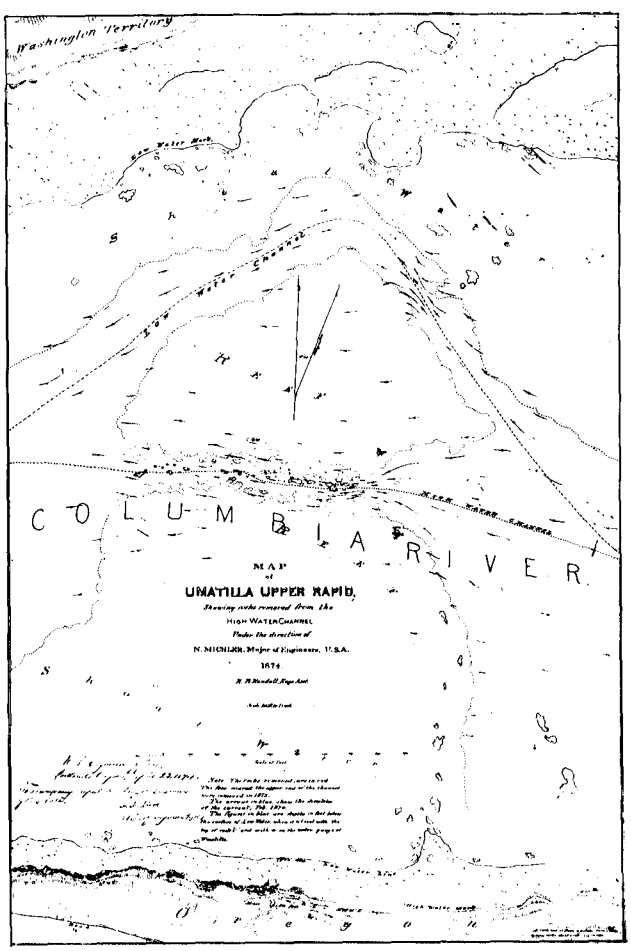


In addition to recommending the 20-foot channel from Portland to the sea, Major Wilson's report of 1876 contained several other proposals. Among them was an examination of the Puyallup River, which flows into the southeastern corner of Puget Sound. Significant deposits of coal were thought to lay 25 miles above the mouth of the river. Development of the resource would be greatly aided by making the river navigable. Assistant Engineer Habersham performed the examination. From the findings, Major Wilson recommended snagging and scraping operations as well as construction of small wing dams to improve the flow of the river. Wilson's superiors rejected the proposal, however, because the entire area drained by the river contained only 400 persons.[30]

Major Wilson also reported in 1876 that rapids still menaced navigation on the upper Columbia River, although considerable improvement had been made. "In order to safely pass them," he wrote, "the steady hand, keen eye, and cool hand of an experienced pilot" were required. He found the Pine Tree Rapids on the Columbia the "worst over which I ever saw navigation attempted."[31] A disastrous accident caused a delay of work begun by Major Michler. Major Wilson sadly reported:

> *On March 1, while engaged on rock 17 [at Upper Umatilla Rapid] the holes having been drilled and cartridges inserted, just as the capstan was being manned, a terrific explosion of giant-powder took place on board the scow, whereby 13 men were killed, one dangerously wounded, and the whole plant destroyed.*[32]

Wilson could provide no explanation for the premature explosion, and replacement of men and equipment postponed work on Upper Umatilla Rapid until late in the following year.[33]

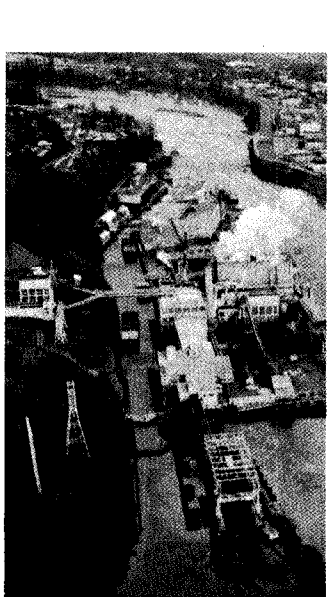


right: Chart of Umatilla Rapid high water channel, below: Implements used in early rock removal at Upper Columbia rapids.

Even without such a delay, removal of rapids on the Columbia and Snake Rivers was a necessarily slow process. Surveys were difficult to make and the few men qualified to perform them were needed elsewhere. Getting and maintaining good equipment consumed much time. Finding workers and keeping them on the job presented problems. The work itself was dangerous and difficult: measuring and drilling of the rocks preparatory to blasting took place from a small platform attached to the stern of a scow (64 by 14 feet), upon which the crew also lived. The scow was secured in position over the rock by rope and cables attached to heavy anchors. The men made holes in the rock with ordinary hand drills and inserted cartridges of giant powder with six-minute fuses. The scow was then hauled out of danger. After the explosion ripped the basalt rock apart, the fragments were removed by raking.[34]

Unfortunately, the work could only be done during low-water periods, which coincided with the most severe winter weather conditions. These factors help to explain why it was not until ten years after Major Wilson left Portland that the engineers finished removal of the rapids as far up the Snake as Lewiston, and as far up the Columbia as Priest Rapids. While projects progressed slowly, the work was done first where it was needed most. As a result, the great bulk of traffic on the Columbia could steam up and down the river with little fear of rapids long before all of them were finally removed.

Major Wilson made considerable progress on the upper Willamette River. Wing dams were constructed at several locations, and repairs were made on those built previously. Snagging and scraping continued, with a total of 707 snags and stumps removed during the 1876 fiscal year alone. One enormous snag was 200 feet long, 24 feet around, and weighed 100 tons. Wilson repeated the requests of his predecessor for another snag boat, and eventually obtained one. Over 20 detailed maps and charts were made of the principal bars on the Willamette. These maps provided the basis for later improvements. Wilson also proposed small dams for the heads of numerous sloughs on the upper Willamette.[35]



above: Locks constructed at Oregon City in 1873, still transport river traffic around Willamette Falls.

River traffic and commerce on the Willamette developed largely because of these improvements. In 1878, three companies operated steam freight and passenger boats on the river. At least 65,000 tons of freight and over 17,000 passengers passed through the locks at Oregon City that year. The locks, completed in 1873, were privately constructed and operated, although the United States Government purchased them several decades later in May 1915. Together with improvements made by the Corps, the locks made the Willamette an important navigational waterway for shallow-draft steamers, riverboats and log rafts.[36]

Major Wilson directed one other important project. The Omnibus River and Harbor Act of 1878 provided for an examination of the Clearwater River in Idaho and the preparation of estimates for "improvements proper to be made." Upon the suggestion of Stephen S. Fenn, delegate from Idaho Territory, plans were made for an examination of the 69 miles from the South Fork to its mouth on the Snake near Lewiston.[37] The survey was performed by Assistant Engineer Phillip G. Eastwick, who had traveled 430 miles by steamer, railroad, and stagecoach just to reach Lewiston. Once there, "he organized his party, being fortunate in obtaining the services of a gentleman who had rafted on the river for several years."[38]

The survey showed that gravel, cobblestone, and boulders in the river provided the principal obstructions to light-draft river steamers. Major Wilson recommended $34,424 for the removal of these obstructions for 40 miles up the river. This improvement would obtain a depth of four and one-half feet, adequate for existing and foreseeable activity on the river. Congress appropriated $15,000, and work on the Clearwater continued until 1884. The work helped open for settlement a potentially rich wheat growing area.[39]

Three surveys made at the mouth of the Columbia and Coquille rivers and at Coos Bay laid the basis for substantial improvements at these locations within a few years. After intense lobbying by local interests and Oregon's congressional delegation, $5,000 was appropriated in 1878 for a thorough survey of the bar at the mouth of the Columbia River. Forest fires and violent, stormy weather delayed the work, but Lieutenant Arthur H. Payson finally concluded it in October. The information obtained was soon incorporated into the most important early project undertaken by the Portland District—the jetty at the mouth of the Columbia.[40]

Major Wilson's last assignment in Portland posed something of a dilemma for him. The omnibus bill authorizing work on the Clearwater River in Idaho also provided for a survey "of the Rogue River, Oregon, from Scottsburg to its mouth." But as Major Wilson pointed out in his report, "Scottsburg is on the Umpqua River, about 100 miles north of the Rogue River, and I was consequently in doubt what action to take." The Chief of Engineers directed him to skip the survey and instead prepare a report from information at hand. This proved more difficult than expected. The mouth of the Rogue, about 270 miles below the Columbia, could only be reached from Portland by taking the railroad to Roseburg and then by a four-day horseback journey across rugged mountains. Lacking the time for such a

Early Portland First National Bank building which housed the Portland Engineer Office.

trip, Wilson

> *"made diligent inquiry in Portland, without success, among merchants, bankers and shippers, to find someone interested in the river from whom I might learn its character. I then wrote to the member of the State legislature from that country; to the Collector of Customs at the mouth of the Rogue, and to the firm of Hume & Duncan, who have a salmon-cannery on the river."*

Receiving no replies before his departure from Portland, Wilson transferred the unfinished Rogue River report to his successor.[41]

Before leaving Portland, Major Wilson also found it prudent to move the engineer office from the wooden frame structure rented by his predecessors to the third floor of the brick First National Bank building. Not only was the new building safer, it was also cheaper. The Chief of Engineers even granted Wilson authority to buy forty yards of rope carpet and a stove for the new quarters.[42] After his successful service in the Portland District, Major Wilson went on to numerous other achievements, including supervision of completion of the Washington Monument, and the superintendency of West Point and of public buildings and grounds in the nation's capital. He concluded his distinguished career as Chief of Engineers, 1897-1901.